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(58) Field of Search

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INT CL<sup>6</sup> G11B 25/04 25/06 31/00, H04B 1/38, H04M  
1/00 1/02 1/05 1/60 1/62 1/72  
ONLINE: WPI, JAPIO

## (54) Portable telephone set and entertainment unit having wireless headset

(57) In the main body unit 1 of a portable telephone set, a radio telephone unit 12 transmits/receives a signal to/from a mobile radio telephone system. An audio entertainment (cassette tape or CD) unit 16 generates an audio signal. A first transmission/reception unit 15 selectively transmits via antenna 14 one of the signal received by the radio telephone unit 12 and the audio signal generated by the audio unit 16, and outputs a transmission signal received by the transmission/reception unit to the radio telephone unit 12. A control unit 17 controls selection of the received signal and the audio signal in the transmission/reception unit 15 in accordance with an incoming call. In a wireless earphone/microphone unit 2 a second transmission/reception unit 22 is connected to the first transmission/reception unit 15 of the main body unit 1 by radio and via antenna 21 receives either the received signal or the audio signal from the main body unit 1 and outputs the selected signal to the earphone 23, and transmits the transmission signal from the microphone 23 to the main body unit 1.

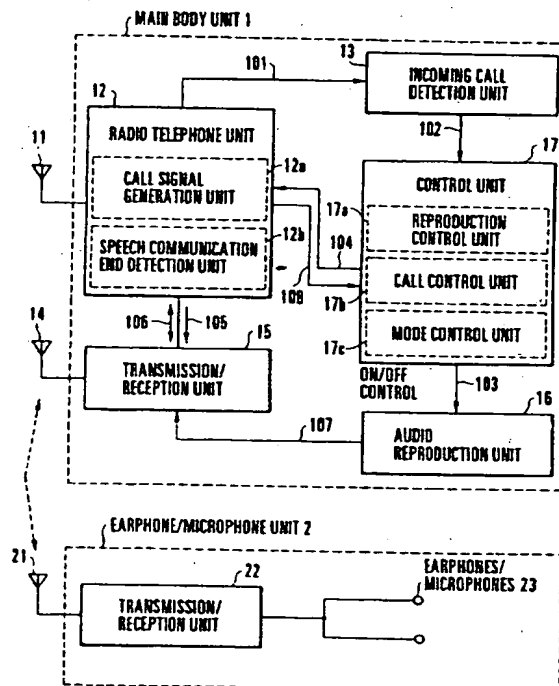


FIG. 2

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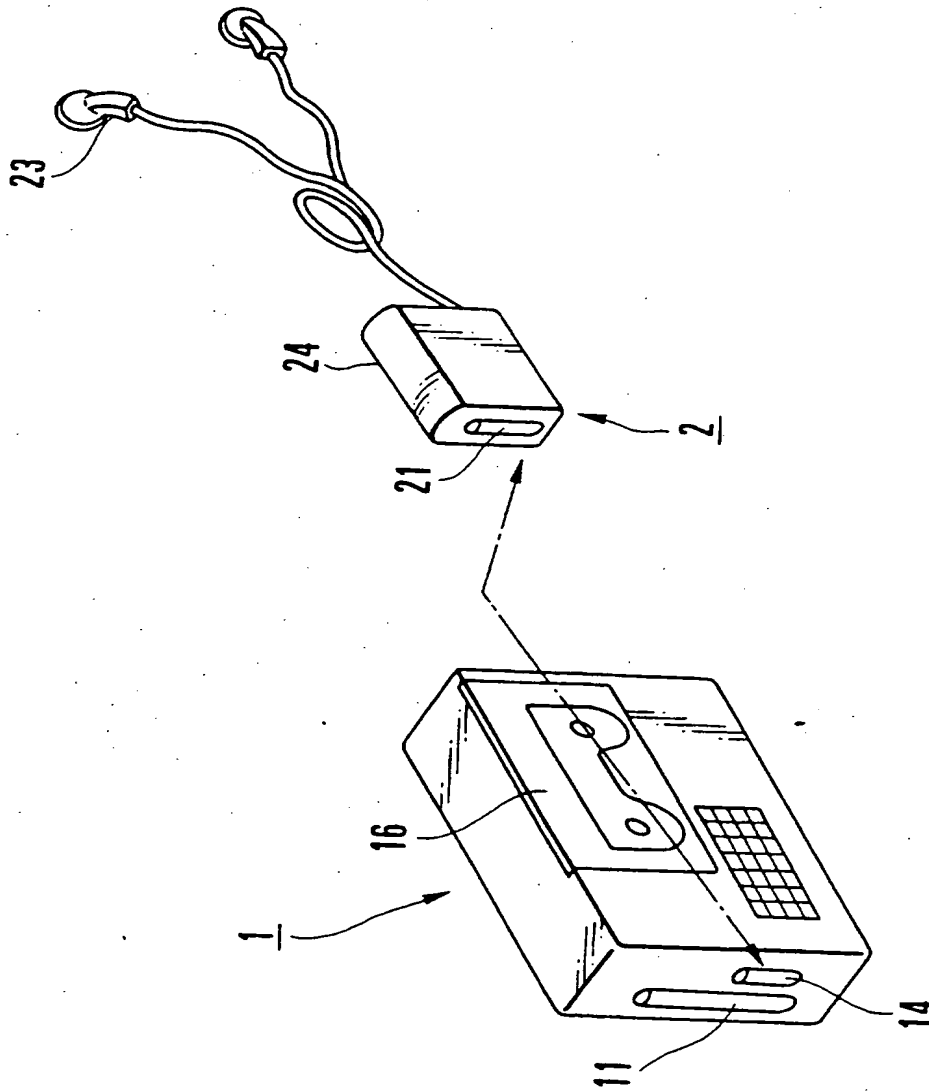


FIG. 1

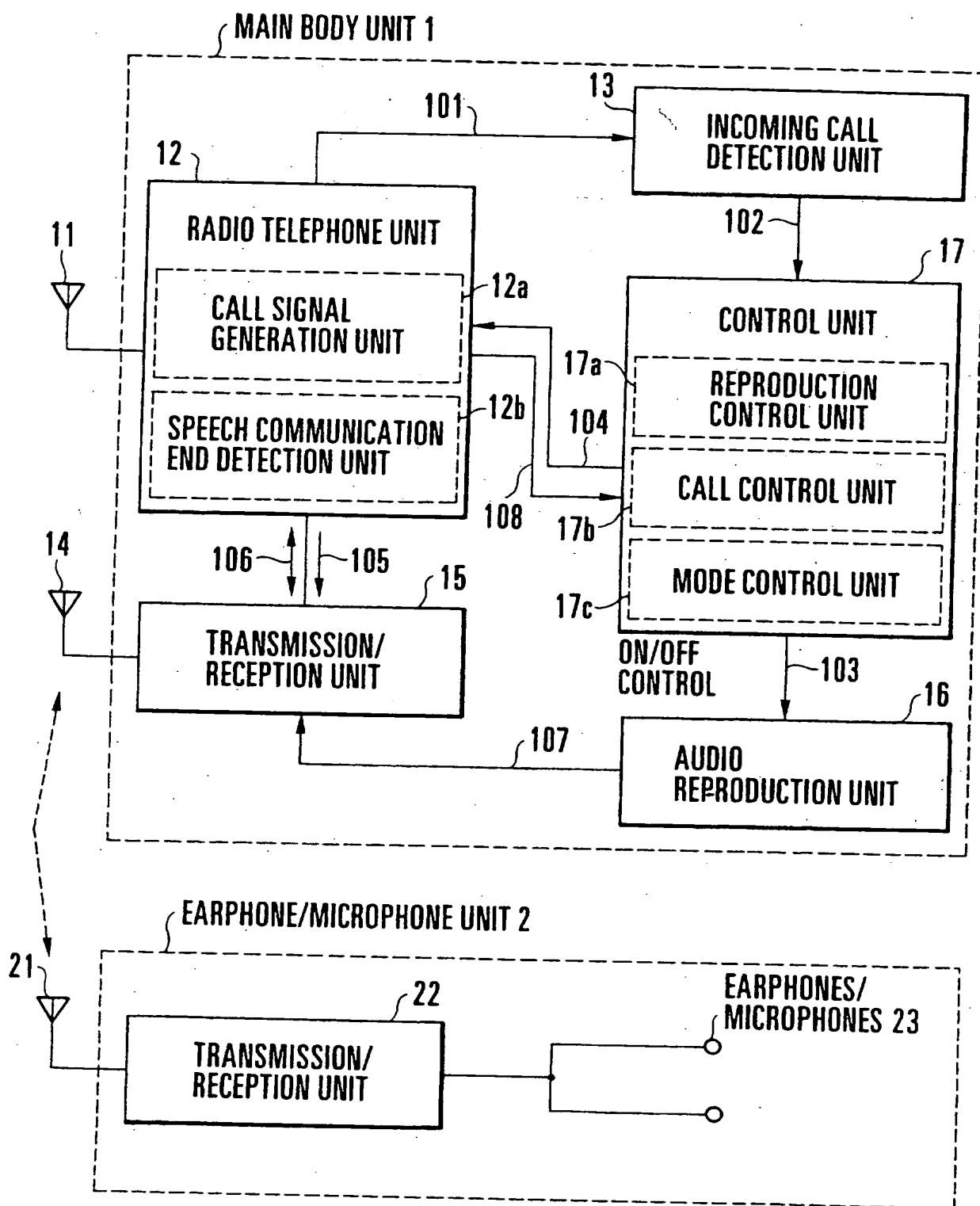


FIG. 2

## Specification

## Title of the Invention

## Portable Telephone Set

## Having Wireless Electroacoustic Transducer

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Background of the Invention

The present invention relates to a portable telephone set and, more particularly, to a portable telephone set integrated with an audio reproduction device and also connected to an electroacoustic transducer such as earphones/microphones by radio.

When a portable telephone set is called in public transportation facilities such as a train or bus, the ringing tone bothers other passengers. To solve this problem, a portable telephone set has been proposed, which is integrated with a headphone stereo as an audio reproduction device such that the ringing tone of the portable telephone set can be listened via the headphone stereo.

A portable telephone set of this type is disclosed in, e.g., Japanese Utility Model Laid-Open No. 5-6958. The conventional portable telephone set of this type has an arrangement in which a pair of earphones can be connected to a headphone stereo unit or a telephone set unit by manually operating a changeover switch. When the pair of earphones are connected to the telephone set unit, one of the earphones is used as a

transmitter, and the other is used as a receiver. Even during music reproduction by the headphone stereo, the user never fail to catch the telephone ringing tone because the telephone ringing tone has priority over the reproduced sound from the headphones. Another portable telephone set having almost the same arrangement is disclosed in Japanese Patent Laid-Open No. 4-243358.

However, the portable telephone set of this prior art has three problems. First, to respond to an incoming call, the changeover switch must be manually operated to switch the headphone stereo mode to the telephone mode. If the user is carrying baggage, or if the portable telephone set is put in a bag, e.g., a handbag, a smooth incoming call response operation is impeded.

Second, in speech communication, one of the earphones is used as a transmitter, and the other is used as a receiver. The user must inevitably use one hand to hold the receiver. Like the above problem, if the hands are not free, the speech communication is difficult.

Third, the portable telephone set is connected to the earphones through cables. When the portable telephone set is put in, e.g., a bag, the bag cannot be separated beyond the length of the earphone cord, so the user cannot put the bag on a baggage rack or the like during the incoming call response operation. The above

problems are particularly conspicuous in crowded transportation facilities, resulting in a disadvantage in improving the utilization efficiency of the portable telephone set.

#### Summary of the Invention

According to the present invention, there is provided a  
15 portable telephone set comprising a main body unit for performing radio communication with a mobile radio telephone system, and a transmission/reception unit connected to the main body unit by radio to perform transmission/reception of a speech voice, the main body  
20 unit including a radio telephone unit for transmitting/receiving a signal containing the speech voice to/from the mobile radio telephone system via a radio channel, an audio unit for generating an audio signal, first transmission/reception means for  
25 selectively transmitting one of a reception voice signal received by the radio telephone unit and the audio signal generated by the audio unit, and outputting a

transmission voice signal received from the  
transmission/reception unit to the radio telephone unit,  
and control means for controlling selection of the  
reception voice signal and the audio signal in the  
5 transmission/reception means in accordance with an  
incoming call, and the transmission/reception unit  
including an electroacoustic transducer for performing  
bidirectional conversion between a voice and an  
electrical signal, and second transmission/reception  
10 means, connected to the first transmission/reception  
means of the main body unit by radio, for selectively  
receiving the reception voice signal and the audio  
signal from the main body unit and outputting the  
selected signal to the electroacoustic transducer, and  
15 transmitting the transmission voice signal from the  
electroacoustic transducer to the main body unit.

#### Brief Description of the Drawings

Fig. 1 is a perspective view showing the outer  
appearance of a portable telephone set with wireless  
20 earphones according to an embodiment of the present  
invention; and

Fig. 2 is a block diagram showing the  
arrangement of the portable telephone set with wireless  
earphones shown in Fig. 1.

#### 25 Description of the Preferred Embodiment

The present invention will be described below  
in detail with reference to the accompanying drawings.

Fig. 1 shows a portable telephone set with wireless earphones according to an embodiment of the present invention, in which the portable telephone set is integrated with a portable cassette tape reproduction device. Fig. 2 shows the circuit arrangement of the portable telephone set with wireless earphones shown in Fig. 1. Referring to Fig. 1, the portable telephone set with wireless earphones of this embodiment is constituted by a main body unit 1 having a music reproducing function and a radio telephone function, and an earphone/microphone unit 2 serving as a transmission/reception unit separated from the main body unit and connected to the main body unit by radio. Reference numeral 11 denotes an antenna provided in the main body unit 1 and connected to the base station of a mobile radio system (not shown) via a radio channel; 14, an antenna of the main body unit 1, which is connected to the earphone/microphone unit 2 by radio; and 16, an audio reproduction unit (to be described later) consisting of a cassette tape reproduction device. Reference numeral 21 denotes an antenna of the earphone/microphone unit 2, which is connected to the main body unit 1 by radio; 23, earphones/microphones (to be described later); and 24, a case in which a transmission/reception circuit is accommodated. The case 24 has the antenna 21 and is connected to the earphones/microphones 23 via cords.



Referring to Fig. 2, the main body unit 1 has a radio telephone unit 12 connected to the antenna 11 to transmit/receive control information and a speech voice signal to/from the mobile radio telephone system (not shown) via a radio channel, an incoming call detection unit 13 for detecting an incoming call notification signal received by the radio telephone unit 12, a transmission/reception unit 15 which is connected to the earphone/microphone unit 2 by radio through the antenna 14 to transmit/receive a speech voice signal to/from the radio telephone unit 12, the audio reproduction unit 16 for reproducing a cassette tape and outputting a reproduction signal of music or the like (to be referred to as a music reproduction signal hereinafter), and a control unit 17 for receiving an incoming call detection signal from the incoming call detection unit 13 and controlling the radio telephone unit 12 and the transmission/reception unit 15. The radio telephone unit 12 has a call signal generation unit 12a for repeatedly generating a call signal consisting of an audible signal at a predetermined period, and a speech communication end detection unit 12b for detecting the end of speech communication of the portable telephone set. The control unit 17 has a reproduction control unit 17a, a call control unit 17b, and a mode control unit 17c, as will be described later.

The earphone/microphone unit 2 has a transmission/reception unit 22 connected to the transmission/reception unit 15 of the main body unit 1 by radio via the antenna 21, and the pair of  
5 earphones/microphones 23 integrated with bone conduction type microphones in which a voice signal input to the earphones for converting a signal received by the transmission/reception unit 22 into a voice signal is converted into an electrical signal and output to the  
10 transmission/reception unit 22. The earphones/microphones 23 having the bone conduction type microphones have an arrangement in which when the user of the portable telephone set speaks while setting the pair of earphones/microphones in both ears, the voice  
15 vibration is conducted through the bones of the user, and the conducted bone vibration is converted into an electrical signal.

The function of the control unit 17 will be described next in detail. When an incoming call is  
20 received at the telephone, the radio telephone unit 12 outputs an incoming call notification signal 101 contained in a signal received via the antenna 11 to the incoming call detection unit 13. The incoming call detection unit 13 detects the incoming call notification  
25 signal 101 and outputs an incoming call detection signal 102 to the control unit 17. Upon receiving the incoming call detection signal 102 from the incoming call

detection unit 13, the reproduction control unit 17a of the control unit 17 outputs a control signal 103 to the audio reproduction unit 16 which is performing a reproducing operation, thereby performing OFF-control.

5 Simultaneously, the call control unit 17b of the control unit 17 outputs a control signal 104 to the radio telephone unit 12 to designate the radio telephone unit 12 to send a call signal 105 to the transmission/reception unit 15. After the call signal 105 is output a predetermined number of times, the mode control unit 17c of the control unit 17 designates the radio telephone unit 12 to switch the mode to the speech communication mode such that a speech voice signal 106 is transmitted/received to/from the transmission/reception unit 15, and speech communication is automatically started.

Upon completion of the speech communication, the mode control unit 17c of the control unit 17 outputs the control signal 104 to designate the radio telephone unit 12 to cancel the speech communication mode. At the same time, the reproduction control unit 17a outputs the control signal 103 to turn on the audio reproduction unit 16. In the operation mode other than the speech communication mode, the audio reproduction unit 16 reproduces music or the like from a cassette tape and outputs a music reproduction signal 107 to the transmission/reception unit 15. The

transmission/reception unit 15 receives the call signal 105 from the radio telephone unit 12 and the speech voice signal 106 received by the antenna 11 or the music reproduction signal 107 from the audio reproduction unit 16 and performs radio communication with the transmission/reception unit 22 of the earphone/microphone unit 2 via the antenna 14.

The operation of the portable telephone set with wireless earphones having the above arrangement will be described below. When the user of the portable telephone set waits for an incoming call at the portable telephone set in crowded transportation facilities, the audio reproduction unit 16 may be driven, so that the user listens to reproduced music of the cassette tape by the headphone stereo. When an incoming call is received at the portable telephone set during music reproduction by the audio reproduction unit 16, the radio telephone unit 12 outputs the incoming call notification signal 101 contained in the received control signal to the incoming call detection unit 13. The incoming call detection unit 13 detects the incoming call notification signal 101 from the radio telephone unit 12 and outputs the incoming call detection signal 102 to the control unit 17. The incoming call detection unit 13 may detect the incoming call notification signal 101 from the control signal.

In response to the received incoming call detection signal 102, the reproduction control unit 17a of the control unit 17 outputs the control signal 103 to the audio reproduction unit 16 during the operation to  
5 turn off the audio reproduction unit 16, thereby stopping the output of the music reproduction signal 107. Simultaneously, the call control unit 17b of the control unit 17 outputs the control signal 104 to the radio telephone unit 12 to designate the radio telephone  
10 unit 12 to send the call signal 105. The call signal generation unit 12a of the radio telephone unit 12 generates a call signal as an audible signal in accordance with the instruction and outputs the call signal to the transmission/reception unit 15. The  
15 transmission/reception unit 15 transmits the call signal from the radio telephone unit 12 to the transmission/reception unit 22 of the earphone/microphone unit 2 via the antennas 14 and 21. The earphones/microphones 23 convert the call signal  
20 into an audio signal and output the voice signal. With this operation, the output of music from the earphones/microphones 23 is stopped, and immediately thereafter, the user is notified of a ringing tone.

When a predetermined number of ringing tones  
25 are counted, the mode control unit 17c of the control unit 17 automatically switches the radio telephone unit 12 to the speech communication mode in accordance with

the control signal 104, thereby automatically responding to the incoming call. With this operation, the input/output of the speech voice signal 106 between the radio telephone unit 12 and the transmission/reception unit 15 is enabled. More specifically, the transmission/reception unit 15 which has transmitted the music reproduction signal 107 from the audio reproduction unit 16 to the earphone/microphone unit 2 so far performs transmission/reception of the speech voice signal 106 between the radio telephone unit 12 and the earphone/microphone unit 2 via the antennas 14 and 21. With this operation, the speech voice signal 106 received by the radio telephone unit 12 via the antenna 11 is transferred from the transmission/reception unit 15 to the transmission/reception unit 22 of the earphone/microphone unit 2 by radio and output from the earphones/microphones 23 as a speech voice.

Since the user can listen to the voice of the caller from the earphones/microphones 23, the user responds by voice without performing any operation. More specifically, the voice signal of the user is bone-conducted and input from the earphones/microphones 23 to the transmission/reception unit 22. The speech signal is further transferred to the transmission/reception unit 15 of the main body unit 1 via the antennas 21 and 14 by radio. The transmission/reception unit 15 outputs the speech signal

received from the earphone/microphone unit 2 to the radio telephone unit 12. The radio telephone unit 12 transmits the voice signal 106 from the transmission/reception unit 15 to the base station of the mobile radio system via the antenna 11. With this operation, speech communication between the caller and the user of the portable telephone set is enabled.

During the speech communication, when the speech communication end detection unit 12b of the radio telephone unit 12 detects that the field state of the caller is lowered to a predetermined level or less, or that a speech voice to be transmitted is not input from the transmission/reception unit 15 for a predetermined time period, a detection signal 108 is output to the control unit 17. When the control unit 17 determines, upon receiving the detection signal 108, that the speech communication is ended, the mode control unit 17c cancels the speech mode of the radio telephone unit 12 on the basis of the control signal 104. At the same time, the reproduction control unit 17a turns on the audio reproduction unit 16 in accordance with the control signal 103. With this operation, the speech communication state is ended. Reproduction of the cassette tape by the audio reproduction unit 16 is restarted from the stop point, so that the user can listen to the same music as before the speech communication.

As described above, in this embodiment, the control unit 17 performs various control operations. Upon receiving an incoming call during music reproduction, the music reproduction is stopped, and a call signal is sent. After a predetermined number of ringing tones are generated, the mode is automatically switched to the speech communication mode. Therefore, the user can start speech communication without performing any manual operation. In addition, since the microphones are constituted by the bone conduction type earphones/microphones 23, hand-free speech communication is enabled. Even while the user cannot move at all in a crowded train or the like, he/she can listen to music and also can respond to an incoming call by allowing automatic switching of the mode to the speech communication mode. In this case, the use catches the ringing tone only through the earphones/microphones 23. Therefore, the others do not hear the ringing tone and therefore are not bothered.

The call signal, the speech voice signal, and the music reproduction signal are transmitted between the transmission/reception unit 15 of the main body unit 1 and the transmission/reception unit 22 of the earphone/microphone unit 2 by radio. For this reason, even when the main body unit 1 is put in a bag on a baggage rack beyond the reach of the user, or in a bag which is inconvenient to immediately take out the main



body unit, the device can be used as a portable telephone set. This makes it unnecessary to always place the main body unit 1 within the reach of the user, resulting in an improvement in operability of the portable telephone set.

5 In the above-described embodiment, the audio reproduction unit 16 is constituted by a cassette tape reproduction unit. However, it may be an audio reproduction device for a compact disk (CD), a mini disk  
10 (MD), or the like, or a radio receiver such as a radio set.

## CLAIMS

1. A portable telephone set characterized by comprising  
a main body unit for performing radio communication with a  
mobile radio telephone system, and a  
5 transmission/reception unit connected to said main body  
unit by radio to perform transmission/reception of a  
speech voice,

said main body unit including

a radio telephone unit for transmitting/receiving a  
10 signal containing the speech voice to/from said mobile  
radio telephone system via a radio channel,

an audio unit for generating an audio signal,

first transmission/reception means for selectively  
transmitting one of a reception voice signal received by  
15 said radio telephone unit and the audio signal generated  
by said audio unit, and outputting a transmission voice  
signal received from said transmission/reception unit to  
said radio telephone unit, and

control means for controlling selection of the  
20 reception voice signal and the audio signal in said  
transmission/reception means in accordance with an  
incoming call, and

said transmission/reception unit including

an electroacoustic transducer for performing  
25 bidirectional conversion between a voice and an electrical  
signal, and

second transmission/reception means, connected to said first transmission/reception means of said main body unit by radio, for selectively receiving the reception voice signal and the audio signal from said main body unit and outputting the selected signal to said electroacoustic transducer, and transmitting the transmission voice signal from said electroacoustic transducer to said main body unit.

2. A set according to claim 1, wherein said first transmission/reception means of said main body unit transmits the generated audio signal to said transmission/reception unit during an operation of said audio unit, and when the incoming call is detected during the operation of said audio unit, said audio unit stops generation of the audio signal, and thereafter, said radio telephone unit transmits a ringing tone signal to said transmission/reception unit through said first transmission/reception means.

3. A set according to claim 2, wherein said radio telephone unit is switched to a speech communication mode after the ringing tone signal is transmitted a set number of times, thereby forming a speech channel between said mobile radio telephone system and said transmission/reception unit.

4. A set according to claim 1, wherein said main body unit comprises incoming call detection means for detecting the incoming call at said radio telephone unit and outputting an incoming call detection signal to said control means, and said control means controls said radio telephone unit and said audio unit in response to the incoming call detection signal from said incoming call detection means.

5. A set according to claim 4, wherein said control means comprises

audio control means for performing OFF-control of said audio unit when the incoming call detection signal is output from said incoming call detection means during an operation of said audio unit,

a call control unit for designating said radio telephone unit to output a ringing tone signal after the OFF-control of said audio unit, and

mode control means for switching said radio telephone unit to a speech communication mode after a predetermined number of call signals are output, thereby automatically starting incoming call communication.

6. A set according to claim 5, further comprising speech communication end detection means for detecting an end of speech communication, and wherein when said radio telephone unit is in the speech communication mode, said mode control means cancels the speech communication mode

of said radio telephone unit on the basis of a speech communication end detection output from said speech communication end detection means.

5 7. A set according to claim 5, wherein said radio telephone unit comprises call signal generation means for repeatedly generating the ringing tone signal consisting of an audible signal at a predetermined period, and wherein said call control unit activates said call signal generation means to transmit the ringing tone signal to  
10 said transmission/reception unit.

8. A set according to claim 1, wherein said electroacoustic transducer comprises an earphone/microphone in which an earphone is integrated with a bone conduction type microphone.

15 9. A portable telephone set, substantially as herein described with reference to the drawings.



Application No: GB 9626159.9  
Claims searched: 1 to 8

Examiner: Peter Easterfield  
Date of search: 4 March 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): G5R (RAC, RAD); H4J (JK)

Int CI (Ed.6): G11B 25/04, 25/06, 31/00; H04B 1/38; H04M 1/00, 1/02, 1/05, 1/60, 1/62, 1/72

Other: Online: WPI, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2283878 A (ERICSSON) see figs. 2, 6 & 7	1 at least
Y	JAPIO Abstract Accession No. 04099316 & JP 050091016 A (TOSHIBA) 09.04.93 (see abstract)	1 at least
Y	JAPIO Abstract Accession No. 02822559 & JP 010120159 A (NEC) 12.05.87 (see abstract)	1 at least

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.